MAP2302 Elementary Differential Equations

Summer B 2025

I. General Information

Section: 4787 meets MTWRF 4th period (12:30 - 1:45 PM) at LIT 205

Instructor: Dr. Chamila Gamage, Office: LIT 320, Email: cgamage@ufl.edu

Office Hours: MTR 11:15 AM - 12:15 PM or by appointment (LIT 320)

The Course Management System is E-Learning (Canvas): https://elearning.ufl.edu/

Course Description: MAP2302 is a course covering first-order ordinary differential equations, theory of linear ordinary differential equations, solutions of linear ordinary differential equations with constant coefficients, the Laplace transform and its application to solving linear ordinary differential equations.

Course Overview: The laws of nature are expressed as differential equations. Scientists and engineers must know how to model the world in terms of differential equations, and how to solve those equations and interpret the solutions. This course focuses on linear differential equations and their applications in science and engineering. More details are given in the course goals below.

Prerequisites: MAC 2312 or MAC 2512 or MAC 3473 with a minimum grade of C.

Course objectives and/or goals: By the end of the course students will know how to

1. Classify differential equations.
2. Model physical phenomena with first and second order differential equations.
3. Visualize solutions to differential equations using direction fields and approximate them using Euler's method.
4. Solve first order separable, linear, and exact differential equations, make equations exact using integrating factors, and use transformations to solve first order differential equations.
5. Solve second order linear differential equations and variable coefficient equations with real or complex roots, solve non-homogeneous differential equations using the method of undetermined coefficients and variation of parameters..
6. Use Laplace transforms to solve differential equations.
7. Solve higher order linear differential equations.

General Education Credit: Mathematics

This course accomplishes the General Education objectives of the subject area listed above. A minimum grade of C is required for General Education credit. Courses intended to satisfy General Education requirements cannot be taken S-U.

Required Reading and Work:

We will use the texbook Fundamentals of Differential Equations and Boundary Value Problems by R. Kent Nagle, Edward B. Saff and Arthur David Snider, ISBN-13: 978-0321977106, ISBN-10: 9780321977106. You may use the previous edition and/or the version without boundary value problems if you prefer.

General Education Objective and Learning Outcomes:

This course will provide instruction in computational strategies in first- and higher order ordinary differential equations including linear ordinary differential equations, solution of ordinary differential equations with constant coefficients, the Laplace transform and its application to solving linear ordinary differential equations, graphical, and numerical approximations to solutions of differential equations. This course includes reasoning in abstract mathematical systems, formulating mathematical models and arguments, using mathematical models to solve problems and applying mathematical concepts effectively to real-world situations.

Materials and Supplies Fees: n/a

II. Graded Work

Assignment	Assignment Description	General Education Mathematics SLOs Met	% of Grade
Participation	Points will be given for in-class activities.	Communication, Content, Critical Thinking	15%
Quizzes	There are weekly in-class quizzes covering the previous week's material. The lowest quiz grades will be dropped at the end of the semester.	Communication, Content, Critical Thinking	15%
Online Homework	One for each lecture, unlimited attemps before the due date. The lowest two scores are dropped.	Communication, Content, Critical Thinking	10%
Midterm exams	There are two in-class Midterm exams.	Communication, Content, Critical Thinking	2 exams at 20% each
Final Exam	In-class exam.	Communication, Content, Critical Thinking	20%

Grading Scale: UF Grading policies may be accessed here.The letter grade will be awarded with Canvas rounding up the display grade (i.e. 89.5 counts as A) as follows:

A	90% or higher	C	70%-74%
A-	87%-89%	C-	67%-69%
B+	85%-86%	D+	64%-66%
B	80%-84%	D	60%-63%
B-	77%-79%	D-	57%-59%
C+	75%-76%	E	0-56%

If you have a grade dispute, please resolve it with your instructor **within a week** of the assignment deadline.

Attendance and Participation: The students are **required** to attend the lectures, and participation will be taken during the class time (see IV. Policies). Excused absences are consistent with university policies in the undergraduate catalog and require appropriate documentation:
https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx

III. Student Learning Outcomes (SLOs)

Description of Graded Work

After successful completion of this course students will have demonstrated competency in the following Student Learning Outcomes (SLOs):

Program Student Learning Outcomes Category

Category	Institutional Definition	Institutional SLO	Specific to the course
Content	Content is knowledge of the terminology, concepts, methodologies and theories used within the subject area.	Students demonstrate competence in the terminology, concepts, methodologies and theories used within the subject area.	Students will gain knowledge of terminology, approximating solutions to differential equations via graphical and computations methods, and analytical methods for solving first and second order differential equations.
Critical Thinking	Critical thinking is characterized by the comprehensive analysis of issues, ideas, and evidence before accepting or formulating an opinion or conclusion.	Students carefully and logically analyze information from multiple perspectives and develop reasoned solutions to problems within the subject area.	Students will apply their knowledge to solve problems concerning topics that include, but are not limited to solving differential equations that are separable, linear, exact, exact with integrating factor, solved using substitutions, and solved by approximations including graphical, and computational methods.
Communication	Students carefully and logically analyze information from multiple perspectives and develop reasoned solutions to problems within the subject area.	Students carefully and logically analyze information from multiple perspectives and develop reasoned solutions to problems within the subject area.	Throughout this course students will communicate mathematical ideas through writing on quizzes and exams.

IV. Policies

Canvas Messages: Check your messages **daily** so that you do not miss any important announcements.

Text: (Not required) Fundamentals of Differential Equations and Boundary Value Problems by R. Kent Nagle, Edward B. Saff and Arthur David Snider, ISBN-13: 978-0321977106, ISBN-10: 9780321977106. You may use the previous edition and/or the version without boundary value problems if you prefer.

Requirements: A hardwired connection (not wireless) is strongly recommended when working and submitting assignments. It is the student's responsibility to have a reliable internet connection, adequate internet speed and cleared cache and cookies before starting each assignment .

Time commitment: University students are expected to spend at least 3 hours for each credit hour in order to keep up with the course material.

Content: We will cover Chapters 1(Introduction), 2(First Order ODEs), 3(Mathematical Models), 4(Second Order ODEs), and 7(Laplace Transforms).

Homework: Doing homework is essential to success in this course and is one of the best ways to prepare for quizzes and tests. Online homework is completed in Canvas. Homework is worth 10% of the grade. The lowest two scores are dropped. Each homework has **unlimited attempts**. Students who miss parts of a multiple-part question should feel free to ask about which parts were missed.

Quizzes: There will be five in-class 30-minute weekly quizzes covering the previous week's material. The lowest score is dropped. Quizzes are worth 15% of the course grade.

Attendance: Attendance is required for lectures and worth 15% of the course grade. You can find information on UF attendance policies here. Attendance is required for exams.

Exams: There will be **two midterm exams** and a **final exam** offered during the regular class time. Each exam is worth 20% of the course grade. **Calculators are not permitted**.

Your grade is comprised of the following:

3 Exams 20% each
Participation 15% (drop three lowest scores)
Quizzes 15% (drop lowest score)
Homework 10% (drop lowest two scores)

Total: 100%.

Exam Dates and Coverage
Exam 1 covers 1.1-1.4, 2.2-2.3 (L1-L6) - Thursday, July 10th
Exam 2 covers 2.4-2.6, 3.2-3.4, 4.1-4.3 (L7-L14) - Thursday, July 24th
Exam 3 covers 4.4-4.6, 7.2-7.6 (L15-L23) - Friday, August 8th

Accommodations for students with learning disabilities: Students with disabilities who experience learning barriers and would like to request academic accommodations should connect with the disability Resource Center by visiting disability.ufl.edu/students/get-started.

Academic Honesty: The course will be conducted in accord with the University honor code and academic honesty policy which can be found at www.dso.ufl.edu/ sccr/honorcodes/honorcode.php. External aids, communication with other students during exams, and calculators are not permitted. Infractions will be reported to the Dean of Students Office. The Mathematics Department expects you to follow the Student Honor Code. We are bound by university policy to report any instance of suspected cheating to the proper authorities.

In addition, we remind you that lectures and the lecture notes given in this class are the property of the University/faculty member and may not be taped/shared without prior permission from the lecturer and may not be used for any commercial purpose. Students found to be in violation may be subject to discipline under the Student Conduct Code.

Makeup Exams: If you miss an exam with valid documentation, you may take a makeup. Valid documentation includes documented illlness, school-sponsored activity, death in the immediate family, court-ordered or military appointments, and religious holidays. Scheduled flights do not count as valid documentation so do not make plans for a flight which conflicts with exam dates and times. If you miss a second exam, the comprehensive third exam will replace it. You will have to contact the instructor to arrange these makeup exams.

If you have a **conflict with another assembly exam in a course that has a higher course number or a religious observance on an exam date**, please request your exam makeup as soon as possible to qualify for a makeup.

If illness or other extenuating circumstances cause you to miss an exam, contact the course coordinator immediately (no later than 24 hours after the exam) by email. Then, as soon as possible after you return to campus, bring the appropriate documentation to the course coordinator.

Late submissions: Due date is not do date! Please do not wait begin your assignments the day that they are due. If there are any last minute difficulties with your computer or access, you will be out of luck. Homework can be submitted late with a 25% penalty for each day beyond the due date.

Evaluations: Course evaluations are now at https://gatorevals.aa.ufl.edu/.

Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at https://gatorevals.aa.ufl.edu/students/. Students will be notified when the evaluation period opens, and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via https://ufl.bluera.com/ufl/. Summaries of course evaluation results are available to students at https://gatorevals.aa.ufl.edu/publicresults/ .

In-Class Recordings: Students are allowed to record video or audio of class lectures. However, the purposes for which these recordings may be used are strictly controlled. The only allowable purposes are (1) for personal educational use, (2) in connection with a complaint to the university, or (3) as evidence in, or in preparation for, a criminal or civil proceeding. All other purposes are prohibited. Specifically, students may not publish recorded lectures without the written consent of the instructor. A "class lecture" is an educational presentation intended to inform or teach enrolled students about a particular subject, including any instructor-led discussions that form part of the presentation, and delivered by any instructor hired or appointed by the University, or by a guest instructor, as part of a University of Florida course. A class lecture does not include lab sessions, student presentations, clinical presentations such as patient history, academic exercises involving solely student participation, assessments (quizzes, tests, exams), field trips, private conversations between students in the class or between a student and

the faculty or guest lecturer during a class session. Publication without permission of the instructor is prohibited. To "publish" means to share, transmit, circulate, distribute, or provide access to a recording, regardless of format or medium, to another person (or persons), including but not limited to another student within the same class section. Additionally, a recording, or transcript of a recording, is considered published if it is posted on or uploaded to, in whole or in part, any media platform, including but not limited to social media, book, magazine, newspaper, leaflet, or third party note/tutoring services. A student who publishes a recording without written consent may be subject to a civil cause of action instituted by a person injured by the publication and/or discipline under UF Regulation 4.040 Student Honor Code and Student Conduct Code.

Diversity: The Mathematics Department is committed to diversity and inclusion of all students. We acknowledge, respect, and value the diverse nature, background and perspective of students and believe that it furthers academic achievements It is our intent to present materials and activities that are respectful of diversity: race, color, creed, gender, gender identity, sexual orientation, age, religious status, national origin, ethnicity, disability, socioeconomic status, and any other distinguishing qualities.

V. Campus Resources:

Health and Wellness U Matter, We Care: If you or someone you know is in distress, please contact umatter@ufl.edu, 352-392-1575, or visit U Matter, We Care website to refer or report a concern and a team member will reach out to the student in distress.

Counseling and Wellness Center: Visit the Counseling and Wellness Center website or call 352-392-1575 for information on crisis services as well as non-crisis services. Student Health Care Center: Call 352-392-1161 for 24/7 information to help you find the care you need, or visit the Student Health Care Center website.

University Police Department: Visit UF Police Department website or call 352-392-1111 (or 9-1-1 for emergencies).

UF Health Shands Emergency Room / Trauma Center: For immediate medical care call 352-733-0111 or go to the emergency room at 1515 SW Archer Road, Gainesville, FL 32608; Visit the UF Health Emergency Room and Trauma Center website.

GatorWell Health Promotion Services: For prevention services focused on optimal wellbeing, including Wellness Coaching for Academic Success, visit the GatorWell website or call 352-273-4450.

Academic Resources E-learning technical support: Contact the UF Computing Help Desk at 352-392-4357 or via e-mail at helpdesk@ufl.edu. Student Health Care Center website.

Student Health Care Center: Call 352-392-1161 for 24/7 information to help you find the care you need, or visit the Student Health Care Center website.

Career Connections Center: Reitz Union Suite 1300, 352-392-1601. Career assistance and counseling services.

Library Support: Various ways to receive assistance with respect to using the libraries or finding resources.

Teaching Center: Broward Hall, 352-392-2010 or to make an appointment 352- 392-6420.

General study skills and tutoring. Writing Studio: 2215 Turlington Hall, 352-846-1138. Help brainstorming, formatting, and writing papers.

Student Complaints On-Campus: Visit the Student Honor Code and Student Conduct Code webpage for more information.

VI. Course Content (Numbering is based on the textbook)

1. Introduction
    - 1.1 Background
    - 1.2 Solutions and Initial Value Problems
    - 1.3 Direction Fields
    - 1.4 The Approximation Method of Euler
2. First-Order Differential Equations
    - 2.2 Separable Equations
    - 2.3 Linear Equations
    - 2.4 Exact Equations
    - 2.5 Integrating Factors
    - 2.6 Substitutions and Transformations
3. Mathematical Models
    - 3.2 Population Models
    - 3.3 Heating and Cooling
    - 3.4 Newtonian Mechanics
4. Linear Second-Order Equations
    - 4.1 The Mass-Spring Oscillator
    - 4.2 Homogeneous Linear Equations
    - 4.3 Auxiliary Equations with Complex Roots
    - 4.4 Non-homogeneous Equations
    - 4.5 The Superposition Principle
    - 4.6 Variation of Parameters
    - 4.7 Variable-Coefficient Equations
7. Laplace Transforms
    - 7.2 Definition of the Laplace Transform
    - 7.3 Properties of the Laplace Transform
    - 7.4 Inverse Laplace Transform
    - 7.5 Solving Initial Value Problems
    - 7.6 Transforms of Discontinuous Functions
    - 7.8 Convolution
    - 7.9 Impulses and the Dirac Delta Function